

ANALYSIS OF THE IMPLEMENTING GREEN ROAD CONSTRUCTION: PROGRESS AND BARRIERS (STUDY OF WEST JAVA – INDONESIA)

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ABSTRACT

The study aims to analyze the implementation of green road construction with a focus on its progress and barriers. Data collection is done through a questionnaire survey with the Delphi technique that involves consultants and contractors in the field of green road construction. Data analysis was performed using descriptive analysis and Delphi analysis to reach consensus or agreement among respondents. Based on the results of the study it is known that the implementation of green construction in the Bandung city has been implemented with an average value of 3.70. Even so, there are still many green construction sub-criteria that are still lacking applied by contractors in Bandung city. Initial investment and expensive maintenance regarding green road construction technology/equipment for contractors as one of indicator from financial criteria is the main barriers in implementation of green road construction. Therefore, a strategy is also needed to overcome the obstacles of each of these aspects.

KEYWORDS: Green Road, Construction, Barriers, Green Construction & Infrastructure

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1. INTRODUCTION

Along with the ever-increasing needs, many parties want to do development in various sectors and one of them is infrastructure development. Infrastructure development is carried out, namely houses, hotels, buildings, offices, centers of worship, highways, bridges, ports, airports, and several other infrastructures that affect every human activity. Of the various infrastructures, road infrastructure is one of the most important infrastructures. Based on data from the 2015-2019 National Medium-Term Development Plan (RPJMN) of the government planning the construction of 2,650 km of new roads, 1,000 km of toll roads and 46,770 km of road maintenance (Bappenas, 2014). With the growth of roads that continue to increase, it will certainly result in reduced availability of natural resources as a form of road structure, increased amount of waste produced by the construction process, increased emissions generated at the development and operational stages, reduced productive land due to land conversion, road construction, and various other impacts related to the environment both directly and indirectly.

To reduce this impact, the concept of green road construction for road construction was introduced. Hasan (2011) at the opening of the International Seminar on The Green Road Construction and International Workshop on The Vetiver Systems stated that Green Road Construction is a sustainability movement that aspires to the creation of road construction since the planning, implementation and use of environmentally friendly, efficient construction product in energy and resource use, and low cost. Some countries in the world have established a green road rating system like the inclusion of Green LESES in New York and Green Roads in Washington in the United States, in the United Kingdom; there is the funding of the Sustainability National Roads Administrations

(SUNRA) (Rehm and Ade, 2013). The Infrastructure Sustainability Council of Australia developed its infrastructure sustainability rating system technique for assessing their level of sustainability on both the existing and new infrastructures with the inclusion of roads and highways. South Korea is also another country that has embraced sustainable technologies and strategies in the construction of roads. The government of South Korea has implemented the Korean Carbon Green Grown Policy to help in addressing environmental issues like climate change and global warming (Hankinson and Breytenbach, 2013). In support of the green practices in the roads construction, the South Korean government has also established research to assess on the development of the Korea Green Road Rating System to aid in the management of highways and roads construction through the use of sustainable practices and technologies. Such government-funded projects for implementing sustainable construction of roads aids in the development of a common understanding and mechanisms of measuring, setting the benchmark, and improving sustainable performance of national highways and roads in matters of documentation and administration (Szydlik, 2014).

Green road construction has so far attracted the attention of construction industry players in Indonesia, since 2015 the Greenroad Rating has been carried out by the Research and Development Agency of the Department of Public Works. Green Road Ranking is carried out to realize sustainable construction in accordance with the Minister of Public Works and Public Housing Regulation No. 05 / PRT / M / 2015 concerning General Guidelines for the Implementation of Sustainable Construction in the Implementation of Infrastructure in the Field of Public Works and Settlements. Green Road Ranking in Indonesia is a system that is prepared to encourage sustainable practices in voluntary road construction activities. This activity must meet the requirements in the form of a Life Cycle Cost document or be represented by a Feasibility Study Report and environmental documents such as Amdal / UKL-UPL / Environmental Permit. Road construction activities are rated according to the level of application of the criteria for the Green Road (PU, 2016).

But in reality, this implementation faces various obstacles that not only occur in large countries but also in other developing countries such as Indonesia which has developed the “Pedoman Jalan Hijau Indonesia” as guidelines in implementing green road construction. As stated by (Hastak, 2018) in developing countries, the general barriers are technical and cultural. Solving these barriers is essential for the construction of roads. Barriers to effective implementation of green roads affect the construction sector at the global level. Nevertheless, the existing research indicated that researchers have a green road design and construction encounter barriers that limit their effectiveness in meeting the requirements for sustainable construction of roads.

So based on this condition, it is necessary to research the implementation of green road construction with case studies in West Java Province. This city chosen as research location because as mention before, for West Java province the road that has succeeded in gaining green road rankings is only achieved by two roads, namely Braga Drainage and Sidewalk Channel, Bandung and the construction of roads and bridges Ibun-Kamojang Bandung Regency. The measurement of the application of green road construction is very much needed as a reference for the central government and regional governments in mapping the readiness for its implementation so that proper handling can be made to the barriers in implementing green road construction.

2. LITERATURE REVIEW

2.1 Green Road Construction

Before discussing more about green road construction researchers try to explain in advance what is meant by greenroad. According to Green Roads Manual Ver 1.5. (2011), Greenroad is defined as a roadway project that is

substantially higher than current common practice. Meanwhile, according to the Ministry of Public Works (2016), green road is a road management activity that applies environmental principles starting from the stages of financing, planning, design, construction and maintenance of roads. And handling the effects of climate change.

The definition of other green roads was put forward by Tanesia (2015), which stated that road management activities apply environmental principles starting from the stages of financing, planning, design, construction, and road maintenance, as well as handling the effects of climate change. Environmental principles are principles that prioritize and pay attention to environmental conservation elements such as the effective and efficient use of water and energy resources, reduction of waste and pollution, and synergy between natural and artificial environments.

While Kibert (2008) argued that green construction is a planning and implementation of the construction process to reduce the negative impact of the construction process on the environment so that a balance exists between the environmental capabilities and needs of human life for present and future generations. Green construction also stated as an effective practice by implementing processes that pay attention to the environment and resource efficiency throughout the life cycle of the building from visible to planning, construction, operation, maintenance, renovation, and deconstruction (United States Environmental Protection Agency, 2010).

So that Green road construction is an ongoing movement that aspires to the creation of road construction since the planning, implementation and use of construction products that are environmentally friendly, efficient in energy and resource use, and low cost. (Ministry of Public Works, 2011). Another case with Umar (2015) stated that Green road construction is a road construction that starts from planning, implementing, monitoring and maintaining it always uses actions that are environmentally friendly, efficient, energy efficient, environmentally sound and always adhere to the principles of the principle of sustainability.

Whereas according to the Department of Public Works (2016) Green road construction is an ongoing movement that aspires to the creation of road construction since the planning, implementation and use of construction products that is environmentally friendly, efficient in the use of energy and resources, and cost low.

2.2 System of Green Road Rating

System of Green Road Rating is a number of systems used in determining the green road rating, assessing a road meet the criteria of green or not green, where the system used refers to certain criteria of the greenroads themselves. In other words, to assess a road that meets the criteria of green or not green can be based on various rating tools systems that have been published in various countries. There are several System of Green Road Ratings issued or developed by several countries in the world, including America with Greenroads version 1.5 and I-LAST, Australia with INVEST and Indonesia with Green Road Guidelines. For more details, the rating system is grouped with several aspects and factors as illustrated in the following table:

Table 1: Comparison of Green Road Ranking Systems

	Greenroads	I-LAST	INVEST	Pedoman Jalan Hijau
Project requirements	V	V	V	
Environment and water	V	V	V	V
Access and equity	V	V	V	V
Construction activities	V		V	V
Material and resources	V	V	V	V
Pavement technologies	V			V

Based on the data above it is known that in ranking a road included in a green road can be based on various rating systems in the form of Guidelines (manuals) that have been published in various countries. Each rating system has a tendency that is different from each other in determining indicators as an instrument of assessment.

2.3 Barriers Related to Green Road Construction

Barriers are something that can hinder progress or achievement of a thing. In this study the inhibiting factors of the process of implementing green road construction are something that causes restraining, obstructing the implementation of green road construction concepts.

Based on the literature review and reinforced by several studies stated that the implementation of green road construction is influenced by some barriers include technical (Balasubramanian, 2012; Samari, et.al, 2013; Powmya and Abidin, 2014; Ametepey, et. al, 2015; Hasan and Zhang, 2016), financial (Balasubramanian, 2012; Hankinson and Breytenbach, 2013; Samari, et.al, 2013; Serpell, et.al., 2013; Djokoto, et.al, 2014; Powmya and Abidin, 2014; Ametepey, ert.al, 2015; Hasan and Zhang, 2016; Aghimien, et. al., 2018), regulatory (Balasubramanian, 2012; Hankinson and Breytenbach, 2013; Serpell, et.al., 2013; Samari, et.al, 2013; Djokoto, et. Al, 2014; Powmya and Abidin, 2014; Ametepey, ert.al, 2015; Hurlimann et al., 2018; Aghimien, et.al., 2018), knowledge (Balasubramanian, 2012; Hankinson and Breytenbach, 2013; Serpell, et. Al., 2013; Powmya and Abidin, 2014; Ametepey, ert.al, 2015; Hurlimann et al., 2018 ;) and culture (Balasubramanian, 2012; Djokoto, et.al, 2014; Powmya and Abidin, 2014; Ametepey, ert.al, 2015). So the barriers to the application of green road construction can be identified as shown in Table 2.

Table 2: Barriers of Green Road Construction Implementation

No	Dimensions	Indicators
1	Technical	Lack of socialization about the green road rating system and green road criteria that have been implemented in Indonesia There are no institutions that issue environmental-friendly material/equipment certificates There is still a lack of alternative materials/equipment and implementation methods in implementing green road construction
2	Financial	Limited budget due to more expensive costs with the implementation of green road construction for project owners Initial investment and costly maintenance regarding green road construction technology/equipment for contractors Financial risk that is felt to be too large for the project owner
3	Regulatory	Lack of detailed rules regarding the implementation of green road construction in Indonesia There is no comprehensive guideline in implementing green road construction Lack of socialization from the government regarding saving natural resources in the field of road construction There has been no request/necessity from the government regarding road construction and maintenance that applies the green road construction concept
4	Knowledge	Lack of government experts in the field of green road construction Lack of contractor's knowledge and experience about green road construction Lack of consultants 's knowledge and expertise about green road construction Lack of training in green road construction
5	Culture	Antipathy / Resistance in implementing green road construction Lack of awareness about the benefits of green road construction

The indicators used to measure Barriers in this study refer to the indicator of the implementation of sustainable construction practices because the green road movement is also synonymous with sustainability, which puts a balance between short-term benefits to long-term risks, with current forms of business that do not damage the environment, health, safety, and future welfare (Ministry of Public Works, 2011).

3. RESEARCH METHOD

In this study, researchers used descriptive methods, this method was chosen because it is in accordance with the purpose of the research, which is to describe the implementation of green road construction. While, to obtain data in the study was required data sources called populations, where the populations for this research are consultant and contractor in Road project of Bandung city. The sampling method used in the study was simple random sampling where contractor and consultant had an equal chance of participating in the study. In the selection of the sample, sampling error was calculated to reduce selection bias. Simple random sampling used in this research has the advantage of little bias as every individual has an equal probability of selection. As a result, contractor and consultant had a similar chance of taking part in the study.

The method used starts with identifying the implementation of the green road construction and the barriers that affect the implementation of the green road construction obtained from the literature as a research variable and a workable solution. To determine the ranking in each research variable can be seen from the comparison between the actual score and the ideal score. Thus the scale categories can be determined as follows:

Table 3: Categories of Score Interpretation

No	Interval	Categories
1	1.0 – 0.8	Very not Good/ very not implemented
2	0.8 – 2.6	Not Good/ not implemented
3	2.6 – 3.4	Moderate
4	3.4 – 4.2	Good/ implemented
5	4.2 – 5.0	Very Good/ very implemented

Next is to use the Delphi method, which is a method that verifies, clarifies and validates each variable measured by an expert. Variables barriers to the implementation of the selected green road construction through validation or respondent opinion were then made into questionnaires containing questions to respondents which were then analyzed by using descriptive analysis methods using the SPSS statistical program.

From the analysis, later the barrier variables from the most influential ones will be obtained until the weakest ones influence the implementation of green road construction. Then from the results of the comparison of the analysis where the most influential variables are made into return questionnaires to obtain validation recommendations for actions from experts and overcome strong and influential barriers to the implementation of green road construction, so that it can be used as a consideration or solution in overcoming problems or barriers found in the implementation of green road construction. The questions posed in the questionnaire use a Likert scale format where this scale is used in questionnaire surveys and is an independent rating scale with the aim of measuring the extent of respondents' opinion on a question. The Likert scale form that will be used in this questionnaire is 1 to 5 where 1 = "strongly disagree"; 2 = disagree; 3 = neutral; 4 = agree; 5 = very agree.

After the Delphi survey is completed, it will be followed by a pair comparison survey or paired matrix survey, which aims to find a relationship between constraints in implementing green road construction. Then the results of the

survey will be analyzed by analyzing the interpretive structural model which will later produce relationships and hierarchies between constraints of constraints in implementing green road construction.

4. RESULT

To obtain data that will be used for analysis to answer the problem formulation and the purpose of this study, questionnaires were distributed to consultants and contractors in road construction projects in West Java with research location in Jl. Ir. H. Juanda of Bandung city as figure below.



Figure 1: Research Location

The result represents the responses of contractors and consultants. Where, the following tables display demographic information:

Table 4: Information of Participants Demographic

Participants' Years of Experience in Road Construction Industry		
Experience	Frequency	Per cent
0-2 years	4	26,67%
2-5 years	6	40,00%
5-10 years	3	20,00%
>10 years	2	13,33%
Total	15	100%
Participants' Sectors in Road Construction Industry		
Sector	Frequency	Per cent %
Contractors	7	46,67%
Consultants	8	53,33%
Total	15	100%

Based on table 3 demonstrated that while 40.00% of participants have 2-5 years of experience in Bandung road construction industry, only 13,33 % have worked here more than years. Moreover 53.33% of the respondents of the questioners are from the consultants and 46.67% are the contractor companies.

The results and processing of each data will be analyzed descriptively and will be displayed using tables to make it easier for readers to understand and answer the objectives of this study. The analysis of this study is divided into two,

namely the first descriptive analysis conducted to determine the application of the greenroad construction, the second is analysis using the Delphi method which is carried out to determine the barriers in the application of greenroad construction. In this research the criteria for applying green construction are grouped into 5 criteria that refer to the Indonesian green road guidelines issued by the government. From the results of the survey obtained, the data originating from the questionnaire were then processed by calculating the average and standard deviation. The results of the analysis for the criteria of implementation of green road construction which is consist in the 5 groups of green road construction implementation criteria in the following table.

Table 4: Criteria of Green Construction Implementation

Criteria	Mean	Stand. Dev	Level of Implementation
Environmental awareness training	4,20	0,86	Implemented
Implementation of flood mitigation from the environment	3,67	0,82	
Reduction of air / dust pollution during construction / post-construction	3,33	0,49	
Environmental management system certificate and application implementation of innovation work	4,13	0,64	
Greening	3,60	0,63	
Protection and avoidance of habitat loss	3,67	0,62	
Provision of road drainage systems	3,60	0,63	
Road lighting restrictions	4,07	0,59	
Noise reduction	3,80	0,68	
Environment and Water	3,79	1,87	
Arrangement of road ornaments and landscapes	4,33	0,62	Very Implemented
Provision of stop facilities to enjoy interesting scenery 6	4,33	0,62	
Provision of access and facilities for public transport users	4,13	0,64	
Geometric design and road equipment facilities to reduce energy use	4,33	0,62	
Implementation of road safety audits	4,00	0,76	
Provision of pedestrian access and facilities	4,27	0,59	
Engagement of community participation in planning	3,87	0,64	
Provision of access and facilities for cyclists	4,33	0,49	
Transportation and Society	4,20	4,97	Implemented
Planning construction recycling and waste activities from the contractor's office / base camp	3,93	0,70	
Methods of using equipment / fleet for construction with certain technologies so that emissions can be reduced	3,67	0,72	
Monitoring / recording of water use during construction	3,67	0,82	
Use of construction equipment that meets the emission threshold	3,33	0,49	
Reduction of fossil fuel use in the construction / contractor base camp	3,73	0,46	
The coordination of the design and construction team to effective and efficient the time of construction	3,47	0,52	
Contractor has a quality management system certificate (SMM)	3,60	0,51	
Construction quality assurance by the contractor that the construction product is in accordance with the quality of the auction process	3,47	0,52	

Use of renewable energy and the application of innovation	3,53	0,52	
Prepare documents for investment or "carbon purchase" activities related to efforts to reduce greenhouse gases or carbon emissions	3,67	0,62	
Construction activities	3,61	2,02	
Use of recycled materials on road projects	3,67	0,49	Implemented
Reuse of chunk material (other than soil) at a local location	3,00	0,65	
Use of local materials.	3,47	0,52	
Use of at least 90% of excavated material for local heaps	3,40	0,51	
Utilization of offload material outside the project location	3,47	0,52	
Street lighting that uses energy saving or renewable energy components	3,53	0,52	
Material and Natural Resources	3,42	0,99	
Design 40-year pavement structures for base layers and <40 years for surface layers	3,40	0,51	Implemented
The use of cold mixtures for bending hardness	3,40	0,63	
Use of porous pavement	3,33	0,49	
Design a pavement surface that can reduce noise	3,67	0,49	
Design a warm paved mixture	3,47	0,52	
Design of pedestrian pavements that maintain sidewalk function	3,47	0,52	
Use of material made without heating	3,47	0,52	
Rigid pedestrian pavement surface design	3,53	0,52	
The use of materials made by heating is lower than the standard temperature	3,53	0,52	
Pavement Technology	3,47	1,03	
Average	3,70	0,76	

From the table above it is known that the implementation of green construction in the Bandung city has been implemented with an average of 3.70 and a standard deviation of 0.76. It's mean that green road constructions have been implemented in road construction in Bandung city. It can be seen from the criteria with the first rank are Transportation and public criteria, its mean the contractor always considers Transportation and public criteria well, namely by Arrangement of road ornaments and landscapes, Provision of stop facilities to enjoy interesting scenery, Geometric design and road equipment facilities to reduce energy use, Provision of pedestrian access and facilities, Provision of access and facilities for cyclists. Also there are some indicators which is shown moderate value for criteria in implementation of green road construction such as: Reduction of air / dust pollution during construction / post-construction, Use of construction equipment that meets the emission threshold, Reuse of chunk material (other than soil) at a local location and Use of porous pavement. Further, the application of the lowest criteria is the criteria of material and resources. It can be happened because criteria for material and resources such as Design 40-year pavement structures for base layers and <40 years for surface layers, The use of cold mixtures for bending hardness and Use of porous pavement is still under average of criteria for implementation of green road construction.

The next analysis knows the barriers in implementing green road construction. In this study the barriers to the application of green construction are grouped into 5 barriers which refer to a literature review of sustainable construction practices and previous research. The analysis carried out through the distribution of obstacle questionnaires using the Delphi method consists of three stages. From the results of the first round of the Delphi questionnaire, the data are then

analyzed descriptively and the results can be seen in the table below:

Table 4: Analysis of Delphi 1 Survey

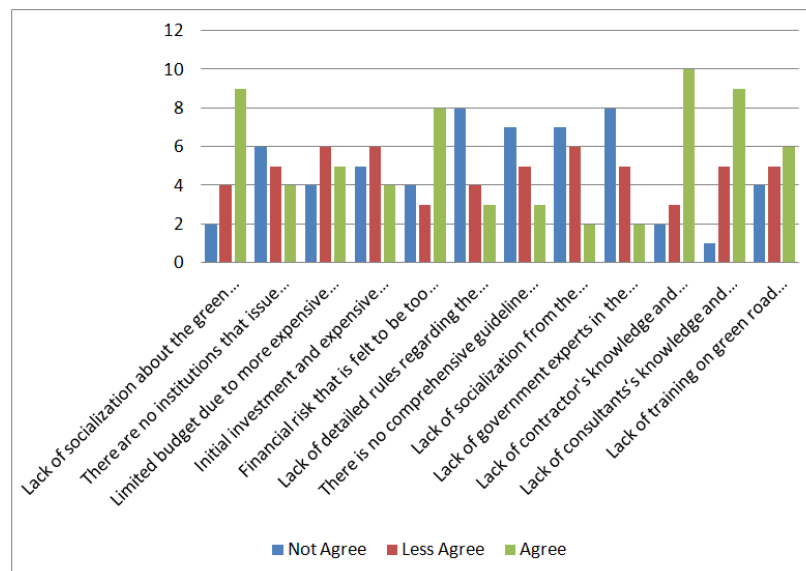
Criteria	Mean	Stand.Dev	Rating
Lack of socialization about the green road rating system and green road criteria that have been implemented in Indonesia (x1)	4,20	0,86	High
There are no institutions that issue certificates for environmental friendly material/equipment (x2)	3,67	0,82	High
There is still a lack of alternative materials / equipment and implementation methods in implementing green road construction (x3)	3,33	0,49	Sufficient
Limited budget due to more expensive costs with the implementation of green road construction for project owners (x4)	4,13	0,64	High
Initial investment and expensive maintenance regarding green road construction technology / equipment for contractors (x5)	3,60	0,63	High
Financial risk that is felt to be too large for the project owner (x6)	3,67	0,62	High
Lack of detailed rules regarding the implementation of green road construction in Indonesia (x7)	3,60	0,63	High
There is no comprehensive guideline in implementing green road construction (x8)	3,53	0,52	High
Lack of socialization from the government regarding saving natural resources in the field of road construction (x9)	3,80	0,68	High
There has been no request / necessity from the government regarding road construction and maintenance that applies the green road construction concept (x10)	3,33	0,49	Sufficient
Lack of government experts in the field of green road construction (x11)	3,80	0,68	High
Lack of contractor's knowledge and experience about green road construction (x12)	3,60	0,63	High
Lack of consultants's knowledge and expertise about green road construction (x13)	3,47	0,52	High
Lack of training on green road construction (x14)	3,87	0,74	High
Antipathy / Resistance in implementing green road construction (x15)	3,20	0,68	Sufficient
Lack of awareness about the benefits of green road construction (x16)	3,33	0,72	Sufficient

From the table above, based on the analysis, it can be seen that variables with a mean above 3.40 are assumed to have a high influence so that the sixteen constraints related to the application of green road construction obtained twelve constraints having a high rating as an obstacle in the implementation of green construction, while the four constraints had a moderate rating. These constraints include: There is still a lack of alternative materials / methods and methods of implementation in implementing green road construction; there has been no request / necessity from the government regarding road construction and maintenance that applies the green road construction concept; antipathy in implementing green road construction and lack of green road construction benefits. After obtaining the first stage of the analysis, the second phase of the questionnaire is re-arranged, this aims to confirm the rating of these constraints. The questionnaire was also given to the same respondents as the respondents in the first phase of the survey. The results of the analysis from the second round survey can be seen in the following table:

Table 5: Barriers in the Implementation of Green Construction

No	Barriers
1	Lack of socialization about the green road rating system and green road criteria that have been implemented in Indonesia
2	There are no institutions that issue certificates for environmental friendly material/equipment
3	Limited budget due to more expensive costs with the implementation of green road construction for project owners
4	Initial investment and expensive maintenance regarding green road construction technology / equipment for contractors
5	Financial risk that is felt to be too large for the project owner
6	Lack of detailed rules regarding the implementation of green road construction in Indonesia
7	There is no comprehensive guideline in implementing green road construction
8	Lack of socialization from the government regarding saving natural resources in the field of road construction
9	Lack of government experts in the field of green road construction
10	Lack of contractor's knowledge and experience about green road construction
11	Lack of consultants's knowledge and expertise about green road construction
12	Lack of training on green road construction

Table 5 above shown that barriers in the implementation of green road construction has a high rating. Furthermore, in the Phase III Delphi questionnaire, respondents were asked to confirm the 12 variables selected in the second phase questionnaire. This confirmation was conducted to validate 12 variables that had been selected in the second phase questionnaire, whether it was really an obstacle in the implementation of green road construction in the city of Bandung. The results of data processing in the Phase III Delphi questionnaire obtained data as shown in Figure 2. Based on Figure 2, 12 of these variables are barriers in the implementation of the green road construction agreed upon by respondents.

**Figure 2: Result of Stage III Delphi Questionnaire**

From the Delphi analysis, 12 variables were found to be barriers in implementing green road construction. To get the influence relationship between the 12 variables, the Interpretative Structural Modeling method is used. Contextual relationships between obstacles are arranged in a single structured interaction matrix or Structural Self Interaction Matrix

(SSIM). Based on the results of the Interpretative Structural Modeling analysis, there are 5 levels of resistance. Figure 3 shows that level 5, namely Initial investment and expensive maintenance regarding green road construction technology / equipment for contractors is the main barriers

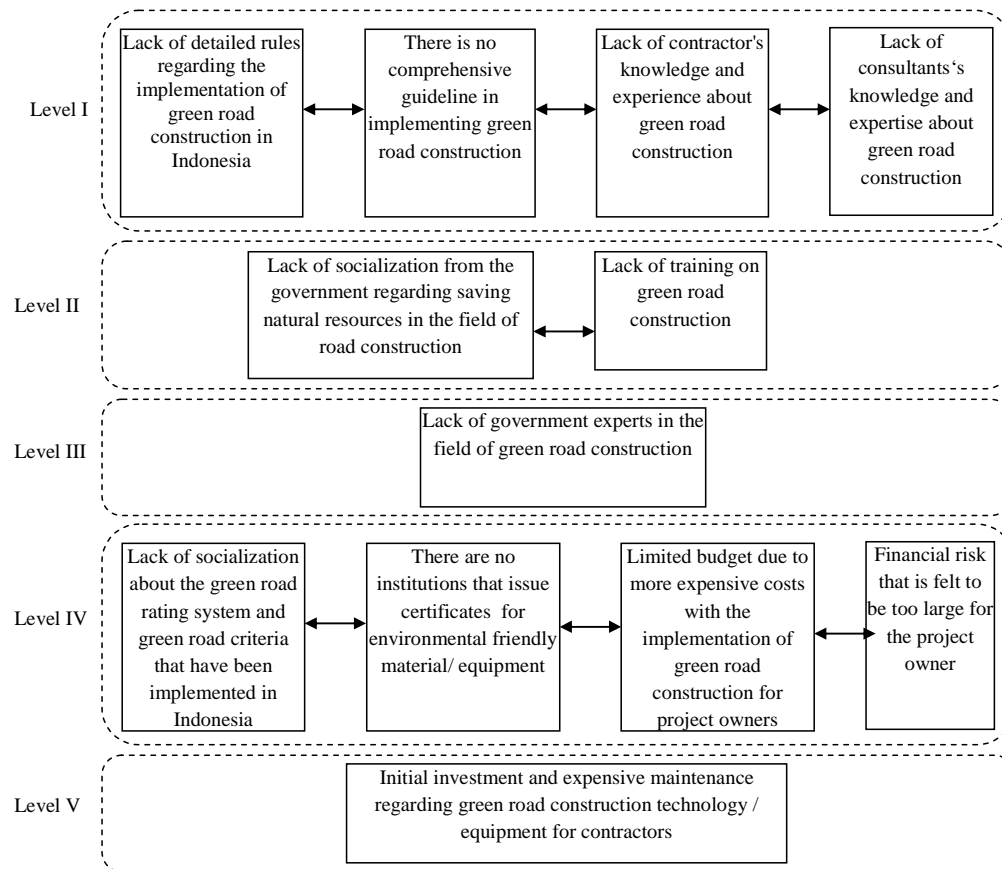


Figure 3: Model Structural of Constraints in the Implementation of Green Road Construction

From figure 3 above known that Initial investment and expensive maintenance regarding green road construction technology / equipment for contractors is main barriers which is included in the dimensions of financial criteria. So did other indicator such as Limited budget due to more expensive costs with the implementation of green road construction for project owners and Financial risk that is felt to be too large for the project owner which is included in the dimensions of financial criteria are barriers in the second level in implementation of green road construction. For those conditions, it needed cooperation between government, consultant and contractors also owner as stakeholder in implementation green road construction, especially for financial criteria. The effort that can be made to prepare funds that can support the initial investment and maintenance related to technology / green road construction equipment for contractors as one of indicator financial criteria.

5. CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on data collection and processing that has been done; conclusions can be taken, among others:

- The application of green construction in the Bandung city especially in Jalan Ir. H. Djuanda has been applied with an average value of 3.70. Even so, there are still many green construction sub-criteria that are still lacking implemented by contractors in Bandung city.

- Initial investment and expensive maintenance regarding green road construction technology / equipment for contractors as one of indicator from financial criteria is the main barriers in implementation of green road construction.

Suggestions

Based on the conclusions above, the authors have some useful suggestions in implementing green construction on construction projects in the Bandung city in the future, namely:

- Give more attention to the application of green construction in a construction project and also needs to do a strategic analysis to overcome the barriers to the implementation of green road construction by involving the parties involved in a road construction project.
- Reducing the barriers that occur in implementing green construction so that contractors can increasingly apply the green road construction criteria and minimize the environmental impacts that occur due to the project being carried out. One of way is prepare funds that can support the initial investment and maintenance related to technology / green road construction equipment for contractors.

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